8TH INTERNATIONAL WILDLAND FIRE CONFERENCE

GOVERNANCE PRINCIPLES: Towards an International Framework

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Creating Gridded Fire Probability Maps using NASA Data

Emily Gargulinski[1], Amber Soja[2], Elizabeth Wiggins[2], Noam Rosenthal[3], Andrew Engler[3]

1- National Institute of Aerospace, 2- NASA Langley Research Center, 3- Kettle

Wildland fire is a natural and integral force on our landscapes, providing value by decreasing fuels at the Wildland Urban Interface (WUI) to promote safe communities. However, uncontained wildfires can devastate communities, threaten our health, and result in substantial economic losses. There has been greater than a $50B increase in wildfire insurance claims from 2017-2021, which has been exacerbated by climate change.

Pre-fire: 11/06/2018 **Post-fire: 12/06/2018**

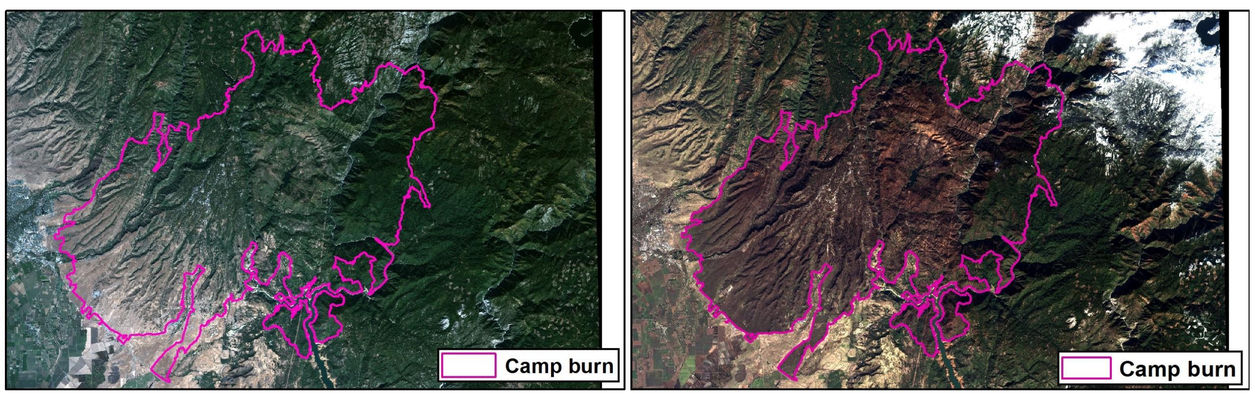
Camp Fire, CA (2018): Homes leveled by the Camp Fire line in the Rodgewood Mobile Home Retirement community in Paradise, CA.

Accelerating Community Recovery from Wildfires

The current insurance claims process is long and costly (up to 1 year for full payment), with many aspects of homes not covered, such as other buildings, sewage, piping etc. We are partnering with Kettle reinsurance company to provide data that will enable a rapid verification of losses, compensating communities for infrastructure losses without the current delay.

We have developed a grid-based wildfire probability product using multiple sources of satellite data that will substantially decrease the time it takes for homeowners to receive payouts, with the goal of accelerating community recovery from wildfires. This product will bring swift payouts to affected homeowners, allowing them to quickly recover and rebuild their lives.

Sentinel-2 Pre-fire: 11/06/2018 **Sentinel-2 Post-fire: 12/06/2018**



The Camp Fire, CA (2018) burned from November 8 – 25th 2018. It is estimated to have cost $16.65 billion (2018 USD), one of the costliest worldwide. It burned 153,336 acres, destroying 18,804 buildings and resulting in 85 deaths. This fire devastated communities and caused the evacuation of ~52,000 people

Relative Difference Normalized Burn Ratio Index (RdNBR)

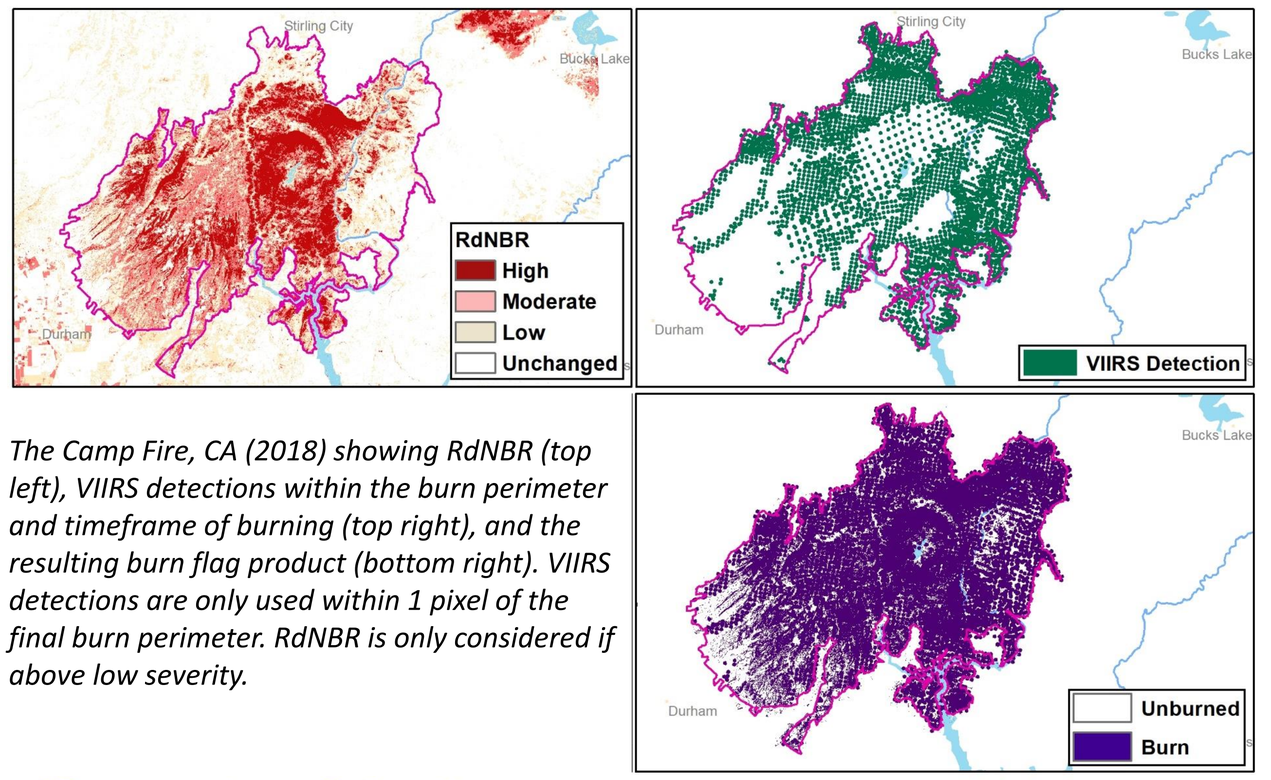
We use the relative dNBR index (Miller and Thode 2006) to provide a more consistent definition of severity between landscapes and allow for higher accuracies in high severity burn in heterogeneous landscapes. After removing water and ice features, we consider high and moderate burn areas as confidently "burned" in our final burn product.

$$NBR = \frac{NIR - SWIR}{NIR + SWIR}$$

$$RdNBR = \frac{PreFireNBR - PostFireNBR}{\sqrt{|PreFireNBR/1000|}}$$

Severity Category	RdNBR
Unchanged	<69
Low	69 - 315
Moderate	316 - 640
High	>=641

We weigh the likelihood of fire based on a number of satellite and ancillary sources that verify a fire burning and the level of confidence in the data source. In our burn product, high and moderate burn in Sentinel-2 RdNBR and VIIRS (Visible Infrared Imaging Radiometer Suite) 375 m active-fire detection data have a high level of confidence and are used to flag burn in and near the final fire perimeter.

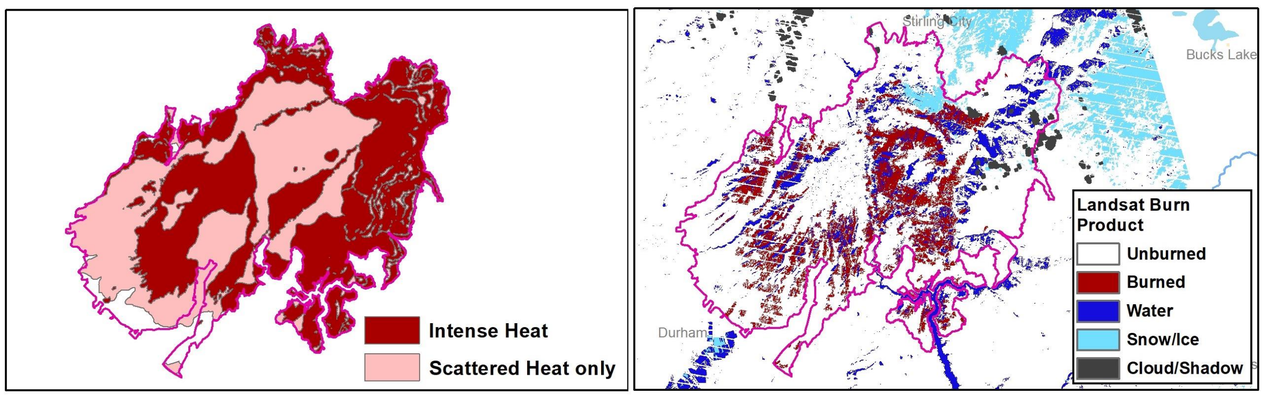


The Camp Fire, CA (2018) showing RdNBR (top left), VIIRS detections within the burn perimeter and timeframe of burning (top right), and the resulting burn flag product (bottom right). VIIRS detections are only used within 1 pixel of the final burn perimeter. RdNBR is only considered if above low severity.

Comparison to NIROPS IR and Landsat Burn Product

We have compared our burn product to the Landsat Burn Product and the National Infrared Operations (NIROPS) IR polygons. NIROPS show the fire intensity at night, across the life of the fire (or whenever they are able to scan the fire). As a note, NIROPS is hand digitized from IR scans, and can contain some unburnt islands.

NIROPS IR polygons **Landsat Burn Classification**



Landsat Burned Area product is a 30-m product generated by comparing the a scene against composites created from seasonal average and previous year acquisitions. The thresholds are relatively strict and can classify some burn as water occasionally.

Intersection of Landsat Burn Product and NIROPS IR products (%)

Landsat Category	NIROPS Scattered heat only	NIROPS Scattered + Intense heat	NIROPS Intense heat	Our Burn Product
Unburned	61%	66%	70%	63%
Burned	20%	16%	13%	19%
Water	12%	12%	12%	12%
Snow/Ice	2%	2%	1%	2%
Cloud/Shadow	0%	1%	2%	1%
NoData	4%	3%	3%	3%

Intersection of our burn product and NIROPS IR products

Our Burn Product	74	79	84

For the Camp fire, of the NIROPS intensely burned areas, our product overlaps 84%, Landsat overlaps 13%. Out of the high severity RdNBR, Landsat calls 47% burned, 22% water, and 26% unburned. We are continuing this process of comparing our burn product to Landsat and NIROPS to refine and verify our product.

Looking Ahead

The first iteration of this product has been developed for responding to wildfires in California, with the possibility to expand nationwide and globally. Our methods are designed to work in other ecosystems and we will be testing its performance outside of California in the future. This product will be made publicly available for use by communities and agencies interested in quick burned area turn around.

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